Applicant: Pauli Koutonen et al.
Application No.: 10/517,893
Response to Office action dated Aug. 10, 2007
Response filed November 30, 2007

Claim Listing

1–7.   (cancelled)

8.   (currently amended) A method for winding a ~~fibrous~~ <u>paper or board</u> web into a web roll of a selected roll hardness distribution, comprising the steps of:

winding a ~~fibrous~~ <u>paper or board</u> web into [[the]] <u>a first</u> web roll by leading the web through a winding nip defined between said web roll and a winding drum, the web defining a [[first]] wrap angle as it passes through the nip, the wrap angle being the amount the web wraps the winding drum before entering the nip when the wrap angle is positive, or the amount the web wraps the web roll before entering the nip when the wrap angle is negative<u>, the winding being performed with the wrap angle regulated according to a first wrap angle function with respect to the diameter of the web roll</u>;

measuring a hardness distribution of the <u>first</u> web roll; and

in response to the measured hardness distribution, <u>winding the paper or board wed into a second web roll, the winding being performed with the wrap angle regulated according to a second wrap function with respect to the diameter of the web roll, the second wrap angle function being different than the first wrap angle function, and repeating the measurement of the hardness distribution and adjustment of wrap angle function</u> ~~changing the wrap angle~~ until the selected roll hardness distribution is achieved.

9.   (currently amended) The method of claim 8, wherein the web passes to the winding drum over at least one guide roll, and wherein [[the]] <u>each</u> step of <u>regulating</u> ~~changing~~ the wrap angle comprises the step of moving the position of the at least one guide roll with respect to the winding drum.

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10.   (currently amended) The method of claim 8 wherein the wrap angle is regulated when there is slippage between the ~~fibrous~~ paper or board web and the winding drum.

11.   (previously presented) The method of claim 8 wherein the method comprises winding a plurality of web rolls in sequence, and wherein the method is employed with each said winding.

12.   (previously presented) The method of claim 8 wherein the method is used with at least one other control mode affecting the structure of the web roll, in which method the structure of the web roll being formed is controlled by regulating one or more of the following factors:

the tension of the web before a windup;

winding force; and

radial nip load in nips through which the web passes.

13.   (currently amended) The method of claim 8 wherein the ~~selected roll hardness is greater than the measured roll hardness distribution and the~~ step of winding according to ~~changing~~ the first or second wrap angle function comprises making the wrap angle larger to increase the roll hardness ~~distribution~~.

14.   (currently amended) The method of claim 8 wherein the step of winding according to ~~changing~~ the first or second wrap angle function comprises making the wrap angle smaller to provide a softer web roll.

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15.   (previously presented) The method of claim 8 wherein the step of measuring the web roll hardness distribution comprises measuring the wound-on-tension in a slitter during running, and the changing of the wrap angle is controlled by a closed control loop, in response to the measured wound-on-tension.

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16.   (currently amended) A method for winding a ~~fibrous~~ paper or board web into a web roll of a selected web hardness distribution, the web passing over at least one guide roll of an apparatus to a nip defined between the web roll and a winding drum, the position of the at least one guide roll being adjustable with respect to the winding drum to adjust the wrap angle of the web as it approaches the nip, the wrap angle being the amount the web wraps the web roll or the winding drum before reaching the nip, the method comprising the steps of:

> winding the ~~fibrous~~ paper or board web into a first roll in the apparatus while
>> regulating the wrap angle with respect to roll diameter according to [[at]] a
>> first wrap angle function;
>
> measuring the first roll hardness distribution;
>
> ~~changing the magnitude of the wrap angle by changing the location of the at least one~~
>> ~~guide roll with respect to the winding drum;~~
>
> if the measured first roll hardness distribution is the selected web hardness
>> distribution, winding the paper or board web into a second roll while
>> regulating the wrap angle with respect to roll diameter according to the first
>> wrap angle function, and if the measured roll hardness distribution is not the
>> selected web hardness distribution winding the ~~fibrous~~ paper or board web into
>> a second roll in the apparatus while regulating the wrap angle according to a
>> second wrap angle function which is different than the first wrap angle
>> function ~~at the changed wrap angle; and measuring the second roll hardness~~
>> ~~distribution, and if the selected hardness distribution is present, retaining the~~
>> ~~wrap angle, and if the selected hardness distribution is not present, changing~~
>> ~~the wrap angle~~, and repeating the winding of rolls, the measuring of the roll
>> hardness distribution, and the changing of wrap angle function until the
>> selected hardness distribution is obtained.

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17.　(currently amended) The method of claim 16 wherein the step of <u>regulating</u> <u>the wrap angle with respect to roll diameter</u> ~~changing the magnitude of the wrap angle~~ comprises increasing the wrap angle.

18.　(currently amended) The method of claim 16 wherein the step of <u>regulating the</u> <u>wrap angle with respect to roll diameter</u> ~~changing the magnitude of the wrap angle~~ comprises decreasing the wrap angle.

19.　(previously presented) The method of claim 16 wherein the structure of the roll being formed is controlled by regulating one or more of the following factors:
> the tension of the web before a windup;
> winding force; and
> radial nip load in nips through which the web passes.

20.　(new) In a method for controlling the structure of a paper or board web roll, in which a paper or board web is wound into a paper or board web roll through a winding nip between the paper or board web roll and a winding drum, the web defining a wrap angle as it passes through the nip, the wrap angle being the amount the web wraps the winding drum before entering the nip when the wrap angle is positive, or the amount the web wraps the web roll before entering the nip when the wrap angle is negative, the improvement comprising controlling the structure of the web roll being formed by adjusting the wrap angle of the web as it passes through the nip during the course of winding the web roll to obtain a desired roll hardness distribution.

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21.   (new) The method of claim 20 further comprising a step of measuring the wound-on-tension in a slitter during running, and the step of regulating the wrap angle comprises changing of the wrap angle by a closed control loop, in response to the measured wound-on-tension to thereby wind the paper or board web roll to a desired roll hardness distribution.

22.   (new) The method of claim 20 wherein the step of adjusting the wrap angle of the web as it passes through the nip during the course of winding the web roll comprises making the wrap angle larger to provide a harder web roll.

23.   (new) The method of claim 20 wherein the step of adjusting the wrap angle of the web as it passes through the nip during the course of winding the web roll comprises making the wrap angle smaller to provide a softer web roll.